**Federal Aviation Administration's**

**Associate Administrator for**

**Commercial Space**

**Transportation (AST)**

# Environmental Program

February 2000

# Our History

In 1984, the Department of Transportation (DOT) was designated as the lead agency for U.S. commercial launch activities by Executive Order of the President. Later that year, Congress enacted the Commercial Space Launch Act of 1984 (CSLA), which authorized DOT to regulate U.S. commercial launch activities. Under the Executive Order and the CSLA, DOT had dual responsibilities:

1) to license and regulate all U.S. commercial launch activities to ensure that they are conducted safely and responsibly, and
2) to promote, encourage, and facilitate the growth of the U.S. commercial space transportation industry.

In November 1995, as part of a DOT reorganization, the office was transferred to the Federal Aviation Administration (FAA). Within FAA, the Office of the Director for Commercial Space Transportation was re-designated as the Associate Administrator for Commercial Space Transportation with the office designation AST. AST is the FAA's sixth line of business.

In October 1998, Congress enlarged AST's role in the oversight of commercial space launch activities to include licensing of reentries and reentry sites.

L A U N C H

V E H I C L E S

# Our Mission

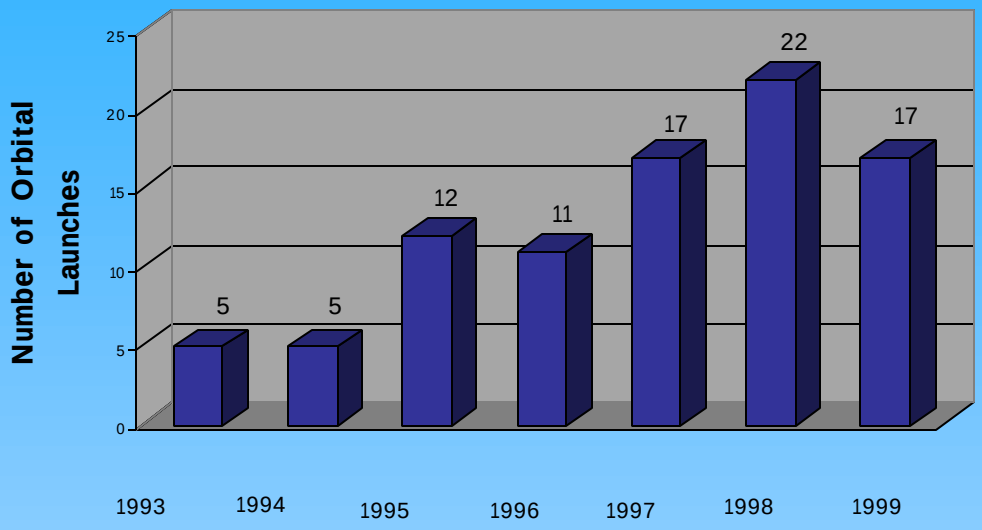
The mission of AST is to regulate the U.S. commercial launch industry and license commercial launches, reentries, launch sites, and reentry sites. AST licenses these activities to protect public health and safety of property and to ensure national security and foreign policy interests of the United States during commercial launch operations.

AST's mission is accomplished through both the regulation of commercial space launch and reentry activities and the promotion of industry growth. Low-cost, reliable access to space is the foundation on which many other commercial and strategic applications of space technology are based. The benefits and spin-offs from these technologies touch almost every aspect of the ability of the United States to remain at the forefront of world technological advancement and economic prosperity. The challenge to both industry and government is to maintain U.S. leadership in the safe exploration and development of space. AST is firmly committed to meeting that challenge.

# Our Experience

In 1999, U.S. launch service providers conducted 17 launches licensed by the FAA. This represents a 22.7 percent decrease from 1998.

**U.S. Licensed Orbital Launch Events**




# Environmental Program

AST licenses U.S. commercial launches, reentries, launch sites, and reentry sites. The environmental review portion of the licensing process ensures that significant environmental impacts of commercial space launch activities on the natural and human environment are fully considered in decision making. The National Environmental Policy Act (NEPA) of 1969, as amended, declares a broad commitment to protect, restore, and enhance the environment. It also requires that Federal agencies:

- consider the environmental consequences of proposed Federal actions and
- ensure that the Federal agency will inform the public that it has considered environmental information in making decisions and taking action.

Bison near the Kodiak Launch Complex, Alaska

The licensing of commercial space launch activities, i.e., conducting launches, operating launch/reentry sites, or some combination, is considered a major Federal action. Consequently, AST is responsible for analyzing the environmental impacts associated with proposed commercial space launch activities. AST is also responsible for preparing appropriate environmental documents such as Environmental Assessments (EAs) and Environmental Impact Statements (EISs) under NEPA. In addition to NEPA there are other Federal, state, and local environmental requirements that may apply. AST integrates its compliance with all applicable laws in the NEPA document to the maximum extent possible.

# Environmental Documentation

**EAs** and **EISs** are specific to the proposed activities/operations that they address. There are basic elements that are addressed in both documents.

**Purpose and Need for Action**: Includes statutory mission and objectives for the proposed action and a discussion of why the proposed action is needed.

**Description of Alternatives**: General project progression, pre-operational activities, operational activities, and post operational requirements are discussed in this section. A reasonable range of alternatives must be addressed. As part of the alternative analysis, an alternative to take no action is also considered.

**Affected Environment**: Describes the baseline or existing environment. It describes environmentally sensitive resources that are present in the proposed project area that may be affected by the proposed action (e.g., floodplains and wetlands, threatened and endangered species, property of historic, archaeological, or architectural significance). This section addresses all physical, biological, social, and economic features of the human environment.

**Environmental Impacts**: Impacts considered include: direct, indirect, long term, short term, and cumulative. Potential environmental impacts of operational accident scenarios are also considered, including accidents that may have very large or catastrophic consequences, even if their probability of occurrence is low. All proposed actions must also comply with other applicable environmental requirements (e.g., Clean Air Act and Clean Water Act, etc.).

**Monitoring Plans:** Outlines steps to be taken by the license applicant to monitor potential impacts to the natural environment before, during, and after launch events.

# Accomplishments

**Draft Programmatic Environmental Impact Statement for Commercial Launch Vehicles:** The draft was released for public comment on September 1, 1999. This PEIS covers commercial launches and reentries from both existing government launch facilities and non-federal launch sites. The PEIS assesses the potential environmental effects of launches from ignition, liftoff and ascent through the atmosphere to orbit, the deposition of expended components down range for expendable vehicles as well as reentries for reusable vehicles. The final PEIS is anticipated in the first quarter of 2000.

**Kodiak Launch Complex (KLC):** On September 15, 1999, the second launch of the US Air Force (USAF) atmospheric interceptor technology (ait) program was successfully completed from Kodiak Launch Complex. AST finalized the environmental assessment and approved the natural resources management plan. The first USAF ait vehicle was launched from KLC on November 5, 1998 as the pioneer vehicle launched from a non-federal U.S. commercial launch site whose operation was licensed and monitored by the FAA.

Kodiak Launch Complex September 1999

# Accomplishments Continued...

Second Successful Sea Launch launch

(Oct. 1999)

**Sea Launch:** AST issued a final EA with an environmental finding on February 11, 1999. Based on lessons learned from the successful demonstration launch in March 1999, AST has updated the Sea Launch environmental Monitoring and Protection Plan. Since then, Sea Launch executed its second successful launch and first commercial satellite deployment on October 9, 1999.

**Orbital Science Corporation's Pegasus/Hydrazine Auxiliary Propulsion System (HAPS), Kwajalein Army Base:** AST issued a Finding of No Significant Impact (FONSI) for Pegasus launches operating from Kwajalein Army Base.

Pegasus Launch Vehicle


Current Pegasus compatible launch sites

**AST Environmental Technology Developments:** AST worked with USAF, National Aeronautics and Space Administration (NASA), and Environmental Protection Agency to address new technologies in the commercial space industry. This group participated in conferences and briefings with U.S. and Russian environmental specialists.

# On-Going Activities

**Kistler Aerospace Corporation:** Kistler proposes to build and test the first newly designed fully reusable space vehicle that would be launched from a Kistler launch site within the boundaries of the Nevada Test Site, a land-locked federal facility. AST intends to hold meetings with local stakeholders, including Indian tribes, to discuss any issues of concern. The draft environmental assessment document is undergoing final FAA review.

**Guidelines for Compliance with NEPA and Related Environmental Review Statutes:** AST will release a revised version of the Environmental Review Guidelines document which will include RLVs in 2000.

**Update AST's Webpage:** The environmental section of AST's Webpage was modified to include useful information for license applicants in a user friendly format.

**Environmental Data Guidelines for License Applicants:** AST intends to update the Site Operator Environmental Guidelines and include launch-related aspects during 2000.

**Proposed Commercial Space Launch Facilities in Idaho, New Mexico, Montana, Oklahoma, Texas, and Utah:** AST is providing guidance and direction to organizations in these states planning commercial space launch facilities.

# Cooperative Efforts

Artist rendition of the X-33 space vehicle

**X-33:** AST played an integral role with NASA as a cooperating agency in the environmental impact review process for the X-33 space vehicle.

**Virginia Space Center (VSC):** AST was a cooperating agency with NASA in the NEPA process for the siting and development of the VSC at Wallops Flight Facility.

**Homestead AFB:** AST is providing technical guidance to the USAF and FAA/Airports in the completion of the Homestead AFB Supplemental EIS which includes proposed launch operations as an alternative to the proposed action.

**Evolved Expendable Launch Vehicle (EELV) SEIS:** AST played an integral role with the USAF as a cooperating agency in the environmental impact review process for the EELV program. AST is currently a cooperating agency with USAF for a supplemental EIS for the EELV program.

**X-34 EA:** AST will participate as a cooperating agency with NASA in the environmental review process for the X-34.

X-34 Reusable Launch Vehicle

# Rocket Propulsion Environmental Impact Research

Consistent with its role under NEPA, AST has continued collaborative efforts by participating in several technical information exchanges to discuss the status of environmental research on the impacts of launch vehicle propellants, specifically on ozone depletion and global warming.

April 1999, ACCENT WB-57F sortie included a fly through of the exhaust plume of an Atlas IIAS kerosene powered launch vehicle.

One such research study is the Atmospheric Chemistry of Combustion Emissions near the Tropopause (ACCENT) project. This study is aimed at resolving uncertainties in the impact of aviation and launch vehicle exhaust on the atmosphere, and focuses on the roles of exhaust in perturbing ozone chemistry and modifying aerosols and clouds. Previous investigations have shown that solid propellant rocket engines emit active chlorine directly into the stratosphere, leading to dramatic ozone loss in the rocket plume wake. LV exhaust typically contains other potentially active gases and aerosols species, however, that might also cause ozone loss. Data obtained during the study will be used to determine if the ozone loss observed in rocket plume wakes can be understood within the context of gas phase chlorine emissions alone, thus providing a measure of the activity of other rocket engine emissions.

Central to ACCENT is progress toward diagnosing the connection between aircraft emissions and cirrus cloud processes through the study of far-field interactions between aircraft-derived particles and upper troposphere and lower stratosphere background species that lead to the formations of ice nuclei and cloud condensation nuclei. ACCENT also measures the characteristics of soot and sulfate aerosol and the gas composition of the exhaust from kerosene-powered LVs, contributing to the identification of heterogeneous reactions and rates on soot that may be relevant to aircraft emissions.

The most recent exchange to discuss launch vehicle emission research was held in November 1999 at Goddard Space Flight Center in Greenbelt, Maryland. The two day conference served as a forum for discussion between FAA, NASA, various industry groups, and independent research groups. A topic of continuing debate was the relative impact of solid rocket motors as compared to liquid propellant systems with respect to their impact on stratospheric ozone depletion. The FAA is committed to keeping abreast of new data related to this issue and will continue to assist research efforts in this field of study.

# Sea Launch: A New Approach

Sea Launch, a multinational, ocean-based launch services company, officially began commercial operations on October 9, 1999 with the launch of the new DIRECTV 1-R direct broadcast satellite. From the equatorial launch site at 154 degrees West longitude, the Sea Launch Zenit-3SL vehicle lifted off from the *Odyssey* launch platform. In March of this year, Sea Launch executed its first launch successfully - that of a demonstration payload which confirmed the design and operation of the complete Sea Launch system.

The Sea Launch joint venture combines the expertise of international aerospace and maritime companies to provide satellite and end-user customers with fully integrated commercial launch service capabilities. The Sea Launch global partnership includes Boeing Commercial Space Company, Seattle, Washington, (provides spacecraft integration and the payload fairings); Kvaerner Maritime a.s., of Oslo, Norway (the vessel builder); RSC Energia of Moscow, Russia (provides the Block-DM upper stage and its integration with the launch vehicle); and KBYuzhnoye/PO Yuzhmash of Ukraine (provides the first two stages of the launch vehicle and launch support operations).

Sea Launch Zenit-3SL Launch Vehicle

With such an international scope, the licensing considerations and process for Sea Launch were unlike those of any other launch facility. The FAA coordinated closely with the State Department; numerous international organizations, with both environmental and socioeconomic/cultural concerns; and the governments of several countries. A few of the key players included the South Pacific Regional Environmental Programme, the Government of Ecuador, and the Government of Australia.

FAA granted Sea Launch two launch licenses in 1999, which included the rights for three launches, two of which have already taken place. With a 100 percent success rate thus far, preparations are now underway at the Sea Launch Home Port in Long Beach, California for the company's next commercial satellite launch in the first quarter of 2000.

The Sea Launch concept provides commercial satellite customers such as DIRECTV, with a direct route to geostationary transfer orbit without requiring a change in flight inclination. Launching from the equator also affords operational benefits including increased performance, high launch availability and reduced launch infrastructure costs. From the ocean-based launch site, the Sea Launch Zenit-3SL rocket can lift a heavy spacecraft mass or place a payload into geostationary transfer orbit, helping satellite operators attain a longer satellite service capability.

# Sea Launch: A New Approach

Sea Launch Home port with vessels. 16.75-acre site within the Port of Long Beach, CA.

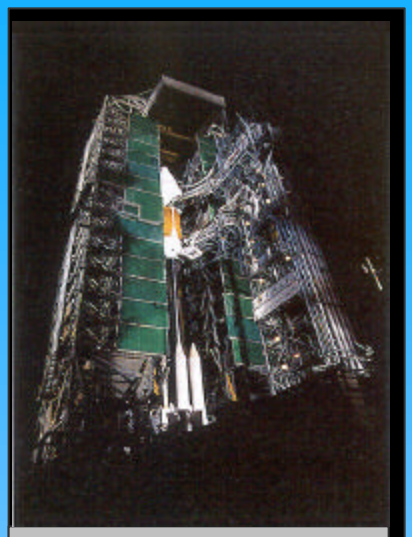

The Assembly and Command Ship serves as a floating vehicle assembly factory.

The Launch Platform--a former North Sea oil drilling platform--is one of the largest semi-submersible self-propelled vessels in the world.

DIRECTV 1-R transfer from Sea Launch Commander to *Odyssey* launch platform.

Encapsulated DIRECTV 1-R direct broadcast satellite.

October 1999, successful launch of the Zenit-3SL rocket carrying DIRECTV- 1R satellite. Launched from the *Odyssey* launch platform at its equatorial launch site.



Atlas IIAS Lockheed Martin Corporation

Roton Rocket Test Flight
Rotary Rocket Corporation

Delta IV
Boeing Company

# Visit AST's Website: http://ast.faa.gov/

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